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REPORTS/THESIS

BARNARD, J. E.

STUDY PLAN< AN EVALUATION OF FIELD MEASUREMENTTECHNIQUES FOR ASSESSING WILDLIFEHABITAT ON RESOURCES EVALUATION10-POINT PRISM PLOTS

by

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9/8/77

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9/14/77

STUDY ABSTRACT SHEET FOR FORMAL STUDIES

Study No.: 4810-FE-NE-4101 ☒ Regular Study

Study Title: An evaluation of field measurement techniques for assessing wildlife habitat on Resources Evaluation 10-point prism plots.

Study Location: Upper Darby, PA ☐ Coop-aid Study

Schedule: Work plan: 7/77 Estimated
Study established: 7/77 completion: 3/78

Assignment: Joseph E. Barnard, Research Forester
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Cooperation: None

Abstract:

Problem: The RPA calls for the development of wildlife habitat data as part of the periodic Assessments of the Nation's Forest and Rangeland. Although this data has been collected in the past for specific purposes there is not a standard technique for collecting the required data in conjunction with other resource measurements.

Objective: To evaluate the potential for collecting wildlife habitat information at the prism sample locations currently used to gather forest area and timber volume statistics. To develop methods for presenting the data to various users.

Method: Field crews will tally data on foliage structure of the understory vegetation and the main tree canopy, browse/mast characteristics, and snag or wolf trees. These data will be summarized and the individual field procedures will be evaluated for their effectiveness and efficiency. Various pictorial techniques for presenting the data will be evaluated.

INTRODUCTION

In 1974, Congress passed the Forest and Rangeland Renewable Resources Planning Act, recognizing the importance of America's renewable resources and calling for a regular assessment, including inventory, of present renewable resources. Renewable resources were defined as "those within the scope of responsibility and authorities of the Forest Service."

The first assessment (USFS 1977) recognized that our nation's forest lands provide habitat for game and nongame species and that the success of these wildlife populations is a reflection of the health of the Nation's lands. However, the same assessment reported little to nothing on the supply of wildlife habitat. Recognizing this data vacuum, the assessment called for habitat data that is directly useful in wildlife management.

This study is proposed to evaluate the potential to broaden the scope of the forest inventory ground plot inventory to include various wildlife habitat components. The value of Resources Evaluation as a sampling vehicle for the evaluation of nontimber forest resources has frequently been appreciated (Barnes 1975, Steinitzke and Pearson 1974, Moore and Strode 1966, Ripley and McClure 1963, Ehrenreich and Murphy 1962). Resources Evaluation provides a forest type and stand size classification system for stratifying resources productivity. State level surveys are repeated periodically allowing for meaningful trend analysis. For discussion, each habitat component proposed for evaluation now will be reviewed singly.

Foliage Structure.--MacArthur and MacArthur (1961) were among the first to recognize and evaluate the influence of foliage structure, specifically vertical foliage stratas, on the diversity of bird species. They were able to show that bird species diversity was predictable from foliage height profiles, and that plant species composition made no significant contribution to the prediction. While their approach was theoretical, the concept has since been incorporated into forest management recommendations (Zeedyk and Evens 1975, Gill et al. 1974, Hooper et al 1973). MacArthur and MacArthur (1961) limited their examination of foliage structure to equivalent vertical strata. Pitelka (1941) reports that life forms of or within the plant community seem to be a controlling factor in bird species distribution. Gill et. al. (1974) includes floral life form as a management objective, favoring "vines of all species, thicket formers, species with showy flowers or foliage, species bearing nuts or fleshy fruits, mixtures of evergreen and deciduous plants and standing dead or dying trees." MacArthur (1958) recognized that coniferous trees create a different habitat structure, each tree having "inside" and "outside" layers independent of vertical structure.

Several methods of measuring foliage vertical diversity in forest stands have been suggested. MacArthur suggests recognizing three distinct strata: 0 to 2 feet, 2 to 25 feet, and 25 feet to the top of the main crown. Within each of these strata the volume of foliage is estimated in percent. Others have modified this method such that the existing foliage vertical distribution is used (1) to determine the number of distinct vertical

strata and (2) to establish the vertical boundaries of each strata.

This method also allows for the recognition of gaps in the vertical column.

MacArthur's procedure establishes arbitrary boundaries which may not conform to the actual foliage vertical structure of a particular forest stand. However, the uniform strata boundaries allow for more specific comparisons and contrasts among forest types and stand-size categories. The alternative procedure may reflect the actual foliage vertical structure more specifically but it presents problems when seeking to make comparisons among stands.

Browse/Mast.---A browse survey is the most common form of wildlife habitat evaluation. Knowing the approximate forage production of an area is essential for the proper estimation of carrying capacity (Barnes 1975, Murphy and Crawford 1970). Knowledge of food resources beyond the browse resource is important if we are to have a complete data base for estimating the available food resources for a multitude of wildlife species (Ehrenreich and Murphy 1962).

For an extensive survey, clip and weigh or twig-count measures of browse productivity are excessively expensive and time consuming (Lyon 1968). While this technique yields data that is precise, it is also so sensitive to annual fluctuations in environmental conditions as to be worthless over any period of time. It would seem better to seek a procedure that is less precise, requires less field time per plot, and yields data that is meaningful over an extended inventory cycle.

The timber inventory procedure used by Resources Evaluation on the 10-point grid includes the tally of seedlings and saplings on a 1/300 acre plot at three of the ten grid points. Expanding this procedure to include the counting of browse and mast-producing shrubs and vines is suggested.

Snag/Wolf Trees.--Snag and wolf trees provide shelter and food resources (indirectly) for both mammal and bird species (Conner et al 1975, McClellan and Frissell 1975, Conner and Crawford 1974, Steele 1972). Differentiation of shelter cavities can be made by individual species (Bull and Meslow 1977, Conner et al 1975) providing information on utilization.

By tallying any snag or wolf tree that is selected with the prism (BAF 37.5) on the 10-point plot, one can estimate numbers of such stems per acre in the stand. Additional information about the condition and utility of such trees for various wildlife uses also could be recorded.

OBJECTIVES

This study seeks to answer the following questions and provide the following information:

1. Can wildlife habitat data be collected on forest survey 10-point prism plots?
2. How applicable are already developed classification techniques to the present plot procedures?
3. What are the strengths and weaknesses of alternative methods for foliage structure analysis?
4. Through a combination of data already being collected on forest area and timber attributes, with wildlife habitat information, can new profiles of the forest resource be developed?
5. Can the wildlife habitat data collected be presented in meaningful form?
6. Does the kind of habitat data collected provide input to the analysis of the current and potential wildlife populations in the study area?

METHODS

At each new 10-point forest field plot location crews will gather additional wildlife habitat data according to the field instructions guide (Appendix A). The data will be tallied in Mercer, Lawrence, Beaver, Washington, and Allegheny counties. These five counties are part of the Western Unit of the Pennsylvania forest survey. Plot selection is covered in the operating plan for the Pennsylvania re-inventory.

Upon completion of the data collection, the wildlife tally forms will be keypunched and data will be summarized for analysis. Specific attention will be given to methods for presenting the results graphically. Field crews will be debriefed and time and difficulty factors will be associated with the alternative procedures.

APPLICATION OF RESEARCH RESULTS

The principal application of the results of this study will be the development of a field procedure to be applied to an entire geographic unit of the Ohio re-inventory. If appropriate, the results of this study will be described, along with the data developed, in a Forest Service Research publication.

SAFETY AND HEALTH

No unusual safety or health hazards should be encountered in this study. In the office work, normal awareness of the need for safety consciousness should be sufficient. In field data collection phase, certain normal hazards such as motor vehicle accidents, falls in the woods, twigs in the eye, and exposure to severe weather conditions are inherent in the job. The normal every day awareness of the need for safety consciousness that is necessary on any field job should be sufficient to prevent accidents of these types. The Work Unit Safety Program emphasizes this.

PERSONNEL ASSIGNMENT, TIME OF COMPLETION, AND COST

Requirements:

(1) Personnel:

1 research forester	2 man-months
1 research wildlife biologist	6 man-months
4 field crews*	3/4 man-month

(2) Travel: (wildlife biologist)

Mileage (1,000 miles @ 15-1/2 cents/mile)	\$ 155.00
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Per diem (60 days @ \$35.00)	2,100.00
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Other travel	100.00
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(3) Computer time and keypunching:	<u>300.00</u>
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Total	\$2,655.00
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Schedule:

Study implementation	7/77
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Study completion	3/78
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* This represents the additional time a field inventory crew will spend in gathering the special wildlife habitat data. All travel, etc., will be charged to regular inventory.

LITERATURE REFERENCES

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APPENDIX A

FIELD INSTRUCTIONS

WILDLIFE HABITAT EVALUATION

FIELD INSTRUCTIONS

<u>Item</u>	<u>Instructions</u>
Plot Identification	This information is identical to that entered on the Forest Inventory Sample Record (NEFES Form 32) for the location.
Point Number	Points 1 - 10 as they are encountered.
	<hr/>
	Points 1 - 10
	<u>Circular Plot, Radius 35 feet</u>
Foliage Strata	At each point, above the circular plot, divide the live foliage into three cylinders, with heights of 0 - 2 feet, 2 feet - 25 feet, and 25 feet - top of the forest canopy, respectively. These three strata are coded as per the code sheet.
Strata Height	(see instructions from SEFES, included herein, note that their strata are measured slightly different.) Above the circular plot, the existing live foliage will be measured in cylinders that correspond to actual foliage strata. The first strata, assuming there is a ground cover, will run from ground level to the top of that dominant vegetation, generally forbs and grass/graminoids. The second strata will run from the bottom of its foliage (or canopy) to the top of its foliage. This second strata will usually correspond to the shrub component of the ecosystem. Each entry, the FROM and TO value, is the height, to the nearest foot, of the observation. Any additional strata are equally defined, from the bottom to the top of the foliage. These strata would be regenerating trees and/or the overstory canopy.
Percent Foliage Volume	(see instructions from SEFES, included herein) For both given foliage strata and measured foliage strata, an ocular estimate is made of the volume of live foliage within the cylindrical plots. The estimate is a percent of the total cylinder volume occupied by live foliage.
Life Form	The life form codes are given on the tally sheet. Within each cylindrical strata, all live foliage greater than 1 percent stocking, is assigned a given life form code, and the percent foliage volume of that life form is estimated. Life form foliage volume estimates must total 100 percent. Trace observations will be recorded as 001 and will not contribute to the total percentage.

Points 1 - 10
Variable Radius Plot

- Snag Species** A snag is defined as any inventoried (by prism) stem (GT than 10 feet height), living or dead. Live trees would generally be tallied in Merchantability Classes 3 or 6.
- Wolf Tree Species** A wolf tree is defined as any inventoried (by prism) stem, where the tree is obviously of an older age class than the stand average. These would generally be individuals that were open grown for the greatest part of their early years.
- Feeding Site** For any snag or wolf tree, if the tree has been used as a feeding site by woodpeckers, as evidenced by stem disturbance, record a Yes observation.
- Cavity Entrance** For each snag or wolf tree, count the number of cavity entrance holes, classed by entrance diameter, and record the number. Mammal entrances will be classed as natural cavities resulting from rot, whereas, bird cavities are those constructed by primary hole nesters. Mammal used cavities are frequently found at ground level.
- Condition Status** The snag condition status codes are given on the tally sheet. For each snag, record the appropriate code. For open branched individuals, a Live, broken top classification requires that a large portion of the original crown is gone, encouraging heart rot from above.

Points 1 - 3
Circular Plot, Radius 6.8 feet

- Browse/Mast Species** Refer to the Systematic List by Life Form of Important Understory Species for codes and identification of important mast producing species. For tree species, use codes given by the Timber Survey instructions.
- Life Form** as described above, from code sheet.
- Origin** Each inventoried browse-stem must be classed as either seedling or sprout origin, and the total number by species recorded.
- Mast Stems** On the plot, all mast producing stems are tallied and the count entered. Mast for this situation is soft mast, i.e. fruits and berries. Common mast producing species are identified on the code sheet.
- Browse Stems** On the plot, record the number of stems of erect tree/

shrub species with some portion of their live canopy within the given height classes.

Vine Foliage Volume

On the plot, estimate the volume (as a percent of a cylinder extending to the forest canopy) of vine species live foliage for those species that produce soft mast. For browse production, estimate the percent foliage volume on the plot with a cylinder of the three height classes.

Utilization Code

Browse utilization codes are given on the tally sheet. For each browse production plot, estimate the percent browse utilized, and enter the appropriate code.

Points 1 - 10
Plotless

Browse Line

At any point, if a browse line is visible, enter a Yes code.

Point Representative

For each point, is the point representative of the location in general. If a No response is warranted, explain under Additional Comments/Observations.

Observations

Across the entire location, record the occurrence of openings, open water, and/or "edge". These should be described in concise but general terms. Any "edge" observed on the location should be easily recognizable. Edge codes are given on the tally sheet. Additional Comments/Observations would include, but not be limited to: squirrel nests and middens, trees barked by bears, unusual concentrations of scats, etc.

CODE SHEET

FOLIAGE STRATA

Code	Strata
1	0 - 2 feet
2	2 feet - 25 feet
3	25 feet - canopy

PLANT LIFE FORM

Code	Life Form
1	Tree (Evergreen)
2	Tree (Deciduous)
3	Shrub (Evergreen)
4	Shrub (Deciduous)
5	Vine (Evergreen)
6	Vine (Deciduous)
7	Forb
8	Fern
9	Grass/Graminoid

SNAG STATUS

Code	Status
1	All dead, intact top
2	All dead, broken top
3	Live, broken top
4	Live, intact dead top
5	Live, intact live top

EDGE CLASSIFICATION

Code	Edge Type
1	Forest - Forest
2	Forest - Shrub
3	Forest - Herbaceous/Agricultural
4	Forest - Cultural
5	Shrub - Herbaceous/Agricultural
6	Shrub - Cultural
7	Herbaceous/Agricultural - Cultural

BROWSE UTILIZATION

Code	Browse Utilization
1	No observed use
2	1% - 10% (Light)
3	11% - 40% (Medium)
4	41% and above (Heavy)

FOR ALL YES/NO QUESTIONS

Code	Response
2	No
1	Yes

COMMENTS/OBSERVATIONS*

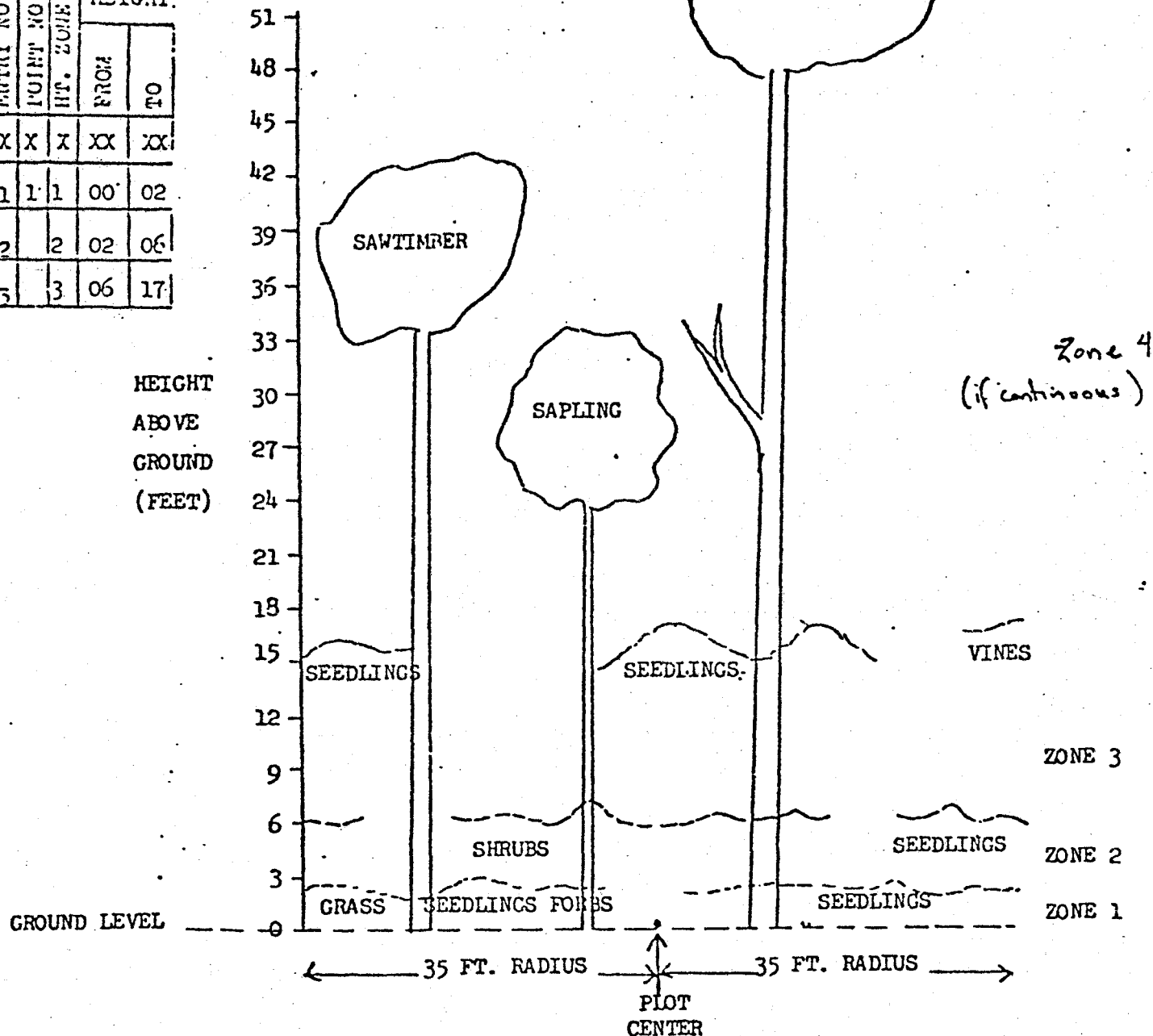
Observation	Yes/No	Comments
Any openings (GT 0.1 acres) on location?	_____	_____
Any open water on location?	_____	_____
Marsh?	_____	_____
Stream?	_____	_____
Pond/Lake?	_____	_____
Any noticeable edge on location?	<u>Yes/No</u>	<u>Type Code</u>
	_____	_____
	_____	_____
	_____	_____

*include situations where points are offset, comment as if points were in original diamond design location.

ADDITIONAL COMMENTS/OBSERVATIONS

ILLUSTRATION OF STRATA HEIGHT

ENTRY NO.	POINT NO.	HT. ZONE	HEIGHT	
			FROM	TO
XX	X	X	XX	XX
01	1	1	00	02
02		2	02	06
03		3	06	17



For each height zone, the vertical length of the foliage will be recorded as a 2-digit code to the nearest foot. The first zone will always run from ground level (00) to some point above the ground. The next zone will run from the ~~top of the first~~ zone to the top of the second zone, etc. The example above demonstrates how the heights should be recorded for an area with three distinct zones.

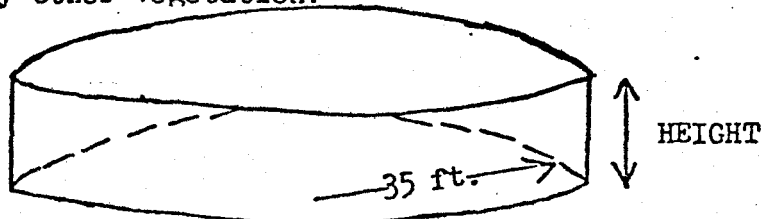
We measure foliage zones by themselves, open space is ignored.

SOURCE:

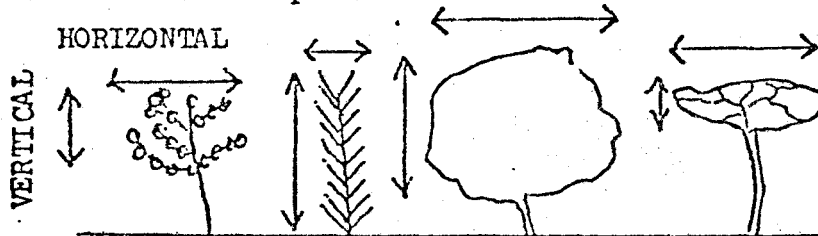
USFS 1977. Forest survey field instructions for South Carolina. USDA, SEFES Renewable Resources Evaluation Proj.

For each height zone, the total foliage density will be estimated to the nearest percent. This 3-digit code should reflect how much of the 35-foot circular area plot is dominated by foliage. Do not include foliage from low hanging limbs of trees that are 1.0 inch d.b.h. or larger. The basic concept of estimating the density of various type and shapes of plants within a 35-foot circular area that is X number of feet high is demonstrated below:

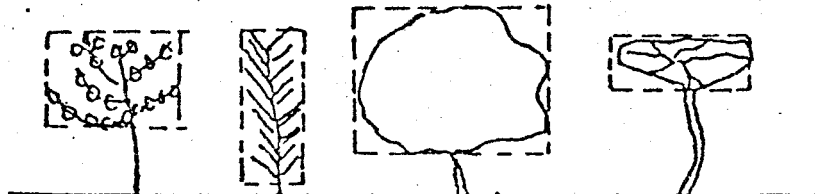
Question: What percent of the circular 35-foot radius is occupied by other vegetation?



Step 1: Assess all or a portion of each individual plant occurring within the 35-foot circular radius from both the horizontal and vertical standpoint.



Step 2: Without compressing or packing the foliage, try to put an imaginary rectangle around each plant.



Step 3: Add all the space taken up by all the plants in a zone and express this as a percent of the total area in the 35-foot circular radius.

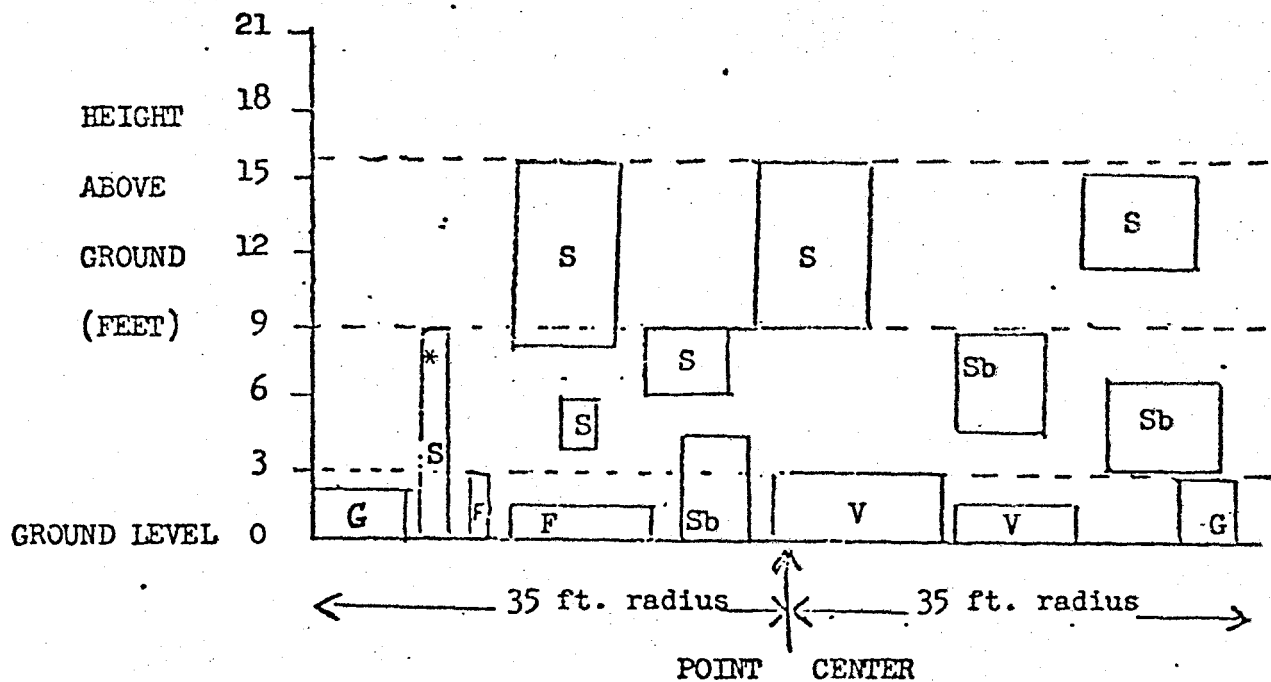
From past experience, it appears that one should first try to bracket the zone percent into one of four classes by asking if it is greater than 75 percent, 75-50 percent, 50-25 percent, or less than 25 percent. Once the estimate is narrowed down to a class, it makes for an easier task to arrive at the nearest percent. It is important to remember that tall plants can contribute to the zone percent in more than one zone. In the following example determine a zone percent for each zone and see if your estimates agree with the ones presented.

ILLUSTRATION 2 - ZONE PERCENT ASSESSMENT

HT. ZONE	HEIGHT		ZONE PERCENT
	FROM	TO	
X	XX	XX	XXX
1	00	03	065
2	03	09	030
3	09	16	035

LEGEND:

S seedling
 V vine
 Sb shrub
 F forb
 G grass



*Vegetation from ground level through 3 feet would count toward Zone 1.
 The remaining vegetation from 3 to 9 feet would count toward Zone 2.

WILDLIFE HABITAT EVALUATION

Systematic List by Life Form of Important Understory Species

<u>Code</u>	<u>Mast</u>	<u>Form</u>	<u>Common Name</u>	<u>Species</u>	<u>Genus</u>
<u>TREE SPECIES*</u>					
120's	no	ET	Pine	spp.	Pinus
090's	no	ET	Spruce	spp.	Picea
010's	no	ET	Fir	spp.	Abies
261	no	ET	Hemlock	canadensis	Tsuga
241	no	ET	Arbor Vitae	occidentalis	Thuja
068	yes	ET	Cedar, Red	virginiana	Juniperus
920's	no	DT	Willow	spp.	Salix
740's	no	DT	Aspen	spp.	Populus
602	no	DT	Walnut, Black	nigra	Juglans
400's	no	DT	Hickory	spp.	Carya
370's	no	DT	Birch	spp.	Betula
531	no	DT	Beech	grandifolia	Fagus
800's	no	DT	Oak	spp.	Quercus
970's	no	DT	Elm	spp.	Ulmus
681	yes	DT	Mulberry, Red	rubra	Morus
682	yes	DT	" , White	alba	"
621	no	DT	Poplar, Yellow	tulipifera	Liriodendron
661	yes	DT	Apple, Domestic	malus	Pyrus
662	yes	DT	" , Crab	coronaria	"
760's	yes	DT	Cherry	spp.	Prunus
591	yes	ET	Holly, Christmas	opaca	Ilex
592	yes	DT	" , Large-leaf	monticola	"
310's	no	DT	Maple	spp.	Acer
693	yes	DT	Blackgum (tupelo)	sylvatica	Nyssa
540's	no	DT	Ash	spp.	Fraxinus
999			Miscellaneous Tree Species		

*for any and all tree species occurring on Timber Survey list, use those codes.

SHRUB SPECIES

938	yes	ES	Yew ^w , Canada	canadensis	Taxus
939	no	DS	Sweetfern	peregrina	Comptonia
940	no	DS	Alder, Speckled	rugosa	Alnus
941	no	DS	Hazelnut, American	americana	Corylus
942	no	DS	" , Beaked	rostrata	"
943	no	DS	Hophornbeam, Eastern	virginiana	Ostrya
944	no	DS	" , American	caroliniana	Carpinus
838	no	DS	Oak, Scrub	ilicifolia	Quercus
931	yes	DS	Sassafras	albidum	Sassafras

945	yes	DS	Spicebush, Common	benzoin	Lindera
946	no	DS	Witch Hazel	virginiana	Hamamelis
947	no	DS	Spirea	spp.	Spirea
948	yes	DS	Mtn. Ash, American	americana	Pyrus
949	yes	DS	" , European	aucuparia	"
960	yes	DS	Serviceberry	canadensis	Amelanchier
500	yes	DS	Hawthorn	spp.	Crataegus
961	yes	DS	Briers or Brambles	spp.	Rubus
962	yes	DS	Rose	spp.	Rosa
763	yes	DS	Cherry, Choke	virginiana	Prunus
963	yes	DS	Sumac, Smooth	glabra	Rhus
964	yes	DS	" , Staghorn	typhina	"
965	yes	DS	Ivy, Poison	radicans	"
593	yes	DS	Holly, Winterberry	verticillata	Ilex
315	no	DS	Maple, Striped	pennsylvanicum	Acer
319	no	DS	" , Mountain	spicatum	"
491	yes	DS	Dogwood, Flowering	florida	Cornus
492	yes	DS	" , Round-leaved	circinata	"
493	yes	DS	" , Red Osier	stolonifera	"
494	yes	DS	" , Panicked	paniculata	"
495	yes	DS	" , Alternate-	alternifolia	"
496	yes	DS	" , Gray leaved	racemosa	"
966	no	ES	Laurel, Mountain	latifolia	Kalmia
967	no	ES	Laurel/Azalea	spp.	Rhododendron
968	no	ES	Teaberry	procumbens	Gaultheria
969	yes	DS	Huckleberry	spp.	Gaylussacia
980	yes	DS	Blueberry	spp.	Vaccinium
981	yes	ES	Partridgeberry	repens	Mitchella
995	yes	DS	Honeysuckle, American	canadensis	Lonicera
996	yes	DS	" , Tartarian	tartarica	"
982	yes	DS	Viburnum, Maple-leaved	acerifolium	Viburnum
983	yes	DS	" , Dentate	dentatum	"
984	yes	DS	" , Sweet	lentago	"
985	yes	DS	Wild Raisin	cassinoides	"
986	yes	DS	Black Haw	prunifolium	"
987	yes	DS	Hobblebush	alnifolium	"
988	yes	DS	Elderberry, Common	canadensis	Sambucus
989	yes	DS	" , Red-berried	racemosa	"
999			Miscellaneous Shrub Species		

VINE SPECIES

990	yes	DV	Greenbrier, Common	rotundifolia	Smilax
965	yes	DV	Ivy, Poison	radicans	Rhus
992	no	DV	Bittersweet, American	scandens	Celastrus
993	yes	DV	Creeper, Virginia	quinquefolia	Parthenocissus
994	yes	DV	Grape	spp.	Vitis
997	yes	DV	Honeysuckle, Glaucous	dioica	Lonicera
998	yes	DV	" , Japanese	japonica	"
999			Miscellaneous Vine Species		

APPENDIX

TREE SPECIES. Codes from 010 to 299 are for softwoods, and from 300 to 999 are for hardwoods. Within those groups, numbers are listed in sequence alphabetically by scientific names of genera, species, and varieties. Each genus has been assigned a code ending in zero to record either an unidentified species or a genus as a group. For those species not indicated in this listing, use the appropriate genus codes. However, it is necessary to identify the specific species of the Maple group, for example, because the *Acer* genus contains both commercial and noncommercial species and high and low wood quality species. The code 999 will be used to indicate noncommercial species instead of the code indicated by an asterisk with possible exceptions.

<u>Code</u>	<u>Common Name</u>	<u>Species</u>	<u>Genus</u>
010	fir	sp.	<u>Abies</u>
012	balsam fir	balsamea var. balsamea	"
040	white-cedar	sp.	<u>Chamaecyparis</u>
043	Atlantic white-cedar	thyoides	"
060	juniper	sp.	<u>Juniperus</u>
068	eastern redcedar	virginiana	"
070	larch	sp.	<u>Larix</u>
071	tamarack	laricina	"
090	spruce	sp.	<u>Picea</u>
091	Norway spruce	abies	"
094	white spruce	glauca	"
095	black spruce	mariana	"
096	blue spruce	pungens	"
097	red spruce	rubens	"
100	pine	sp.	<u>Pinus</u>
105	jack pine	banksiana	"
110	shortleaf pine	echinata	"
123	table-mountain pine	pungens	"
125	red pine	resinosa	"
126	pitch pine	rigida	"
128	pond pine	serotina	"
129	eastern white pine	strobus	"
130	Scotch pine	sylvestris	"
131	loblolly pine	taeda	"
132	Virginia pine	virginiana	"
221	baldcypress	distichum var. districhum	<u>Taxodium</u>
241	northern white-cedar	occidentalis	<u>Thuja</u>
261	eastern hemlock	canadensis	<u>Tsuga</u>

<u>Code</u>	<u>Common Name</u>	<u>Species</u>	<u>Genus</u>
310	maple	sp.	<u>Acer</u>
313	box elder maple	negundo	"
*315	striped maple	pennsylvanicum	"
316	red maple	rubrum var. rubrum	"
317	silver maple	saccharinum	"
318	sugar maple	saccharum	"
*319	mountain maple	spicatum	"
330	buckeye	sp.	<u>Aesculus</u>
331	Ohio buckeye	glabra	"
332	yellow buckeye	octandra	"
*340	ailanthus	sp.	<u>Ailanthus</u>
370	birch	sp.	<u>Betula</u>
371	yellow birch	alleghaniensis	"
372	sweet birch	lenta	"
373	river birch	nigra	"
374	water birch	occidentalia	"
375	paper birch	papyrifera var. papyrifera	"
*379	gray birch	populifolia	"
*391	American hornbeam	caroliniana	<u>Carpinus</u>
400	hickory	sp.	<u>Carya</u>
402	bitternut	cordiformis	"
403	pignut	glabra	"
404	pecan	illinoisensis	"
405	shellbark	laciniosa	"
407	shagbark	ovata	"
409	mockernut	tomentosa	"
421	American chestnut	dentata	<u>Castanea</u>
*450	catalpa	sp.	<u>Catalpa</u>
461	sugarberry	laevigata	<u>Celtis</u>
462	hackberry	occidentalis	"
*471	eastern redbud	canadensis	<u>Ceris</u>
491	flowering dogwood	florida	<u>Cornus</u>
*500	hawthorn	sp.	<u>Crataegies</u>
521	common persimmon	virginiana	<u>Diospyros</u>
531	American beech	grandifolia	<u>Fagus</u>
540	ash	sp.	<u>Fraxinus</u>
541	white ash	american	"
543	black ash	nigra	"
544	green ash	pennsylvanica	"
545	pumpkin ash	profunda	"
546	blue ash	quadrangulata	"
552	honeylocust	triacanthus	<u>Gleditsia</u>
571	Kentucky coffeetree	dioicus	<u>Gymnocladus</u>
591	American holly	opaca	<u>Ilex</u>
601	butternut	cinerea	<u>Juglans</u>
602	black walnut	nigra	"
611	sweetgum	stryraciflua	<u>Liquidambar</u>
621	yellow-poplar	tulipifera	<u>Liriodendron</u>

<u>Code</u>	<u>Common Name</u>	<u>Species</u>	<u>Genus</u>
*641	osage-orange	pomifera	<u>Maclura</u>
651	cucumbertree	acuminata var. acuminata	<u>Magnolia</u>
653	sweetbay	virginiana	"
*660	apple.	sp.	<u>Malus</u>
*680	mulberry	sp.	<u>Morus</u>
690	tupelo	sp.	<u>Nyssa</u>
693	black tupelo	sylvatica var. sylvatica	"
*701	eastern hophornbeam	virginiana	<u>Ostrya</u>
*711	sourwood	arboreum	<u>Osydendrum</u>
731	American sycamore	occidentalis	<u>Platanus</u>
740	cottonwood; popular	sp.	<u>Populus</u>
741	balsam popular	balsamifera	"
742	eastern cottonwood	deltoides	"
743	bigtooth aspen	grandidentata	"
746	quaking aspen	tremuloides	"
760	cherry; peach; plum	sp.	<u>Prunus</u>
*761	pin cherry	pensylvanica	"
762	black cherry	serotina	"
800	oak	sp.	<u>Quercus</u>
802	white oak	alba	"
804	swamp white oak	bicolor	"
806	scarlet oak	coccinea	"
809	northern-pin oak	ellipsoidalis	"
812	southern red oak	falcata var. falcata	"
813	cherry bark; swamp red oak	falcata var. pagodaefolia	"
817	shingle oak	imbricaria	"
822	overcup oak	lyrata	"
823	bur oak	macrocarpa	"
*824	blackjack oak	marilandica	"
825	suamp chestnut oak	michauxii	"
826	chinkapin oak	muchlenbergii	"
827	water oak	nigra	"
830	pin oak	palustris	"
831	willow oak	phellos	"
832	chestnut oak	prinus	"
833	northern red oak	rubra	"
834	shumard oak	shamardii	"
835	post oak	stellata var. stellata	"
837	black oak	velutina	"
901	black locust	pseudoacacia	<u>Robinia</u>
920	willow	sp.	<u>Salix</u>
922	black willow	nigra	"
*931	sassafras	albidum	<u>Sassafras</u>
950	basswood	sp.	<u>Tilia</u>
951	American basswood	americana	"
970	elm	sp.	<u>Ulmus</u>
971	winged elm	alata	"
972	American elm	americana	"
975	slippery elm	rubra	"
977	rock elm	thomasii	"

CodeCommon Name

999

Noncommercial species,
including those marked *

ailanthus
apple, sp.
birch, gray
boxelder
catalpa, sp.
cherry, choke
cherry, pin
empress tree, pawlonia
fringetree
hawthorn
hophornbeam
hornbeam
magnolia, fraser
magnolia, umbrella
maple, mountain
maple, striped
mountain-ash, American
mulberry, sp.
oak, bear
oak, blackjack
osage-orange
pawpaw
redbay
redbud
sassafrass
serviceberry
sourwood
sweetleaf
willow, sp. except black